

# Locally Equivalent Weights for Bayesian MrP

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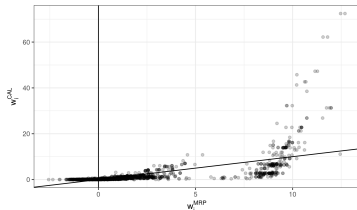
# Standard error estimation

Does this mean anything?

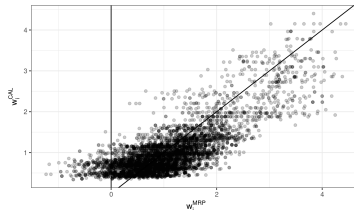
**Yes:** We can meaningfully sum these weights against regressors.

What else might it mean?

**Does the spread relate to frequentist variance?**



**Figure 1:** Comparison between raking and MrPlew weights for the Name Change dataset



**Figure 2:** Comparison between raking and MrPlew weights for the Gay Marriage dataset

## Standard error consistency theorem: (sketch)

For Bayesian hierarchical logistic regression, define

$$\varepsilon_n = y_n - \mathbb{E}_{\mathcal{P}(\theta|\text{Survey data})} [m(\mathbf{x}_n^\top \theta)] \quad \text{and} \quad \psi_n := N_S w_n^{\text{MrP}} \varepsilon_n.$$

We state mild conditions under which, as  $N \rightarrow \infty$ ,

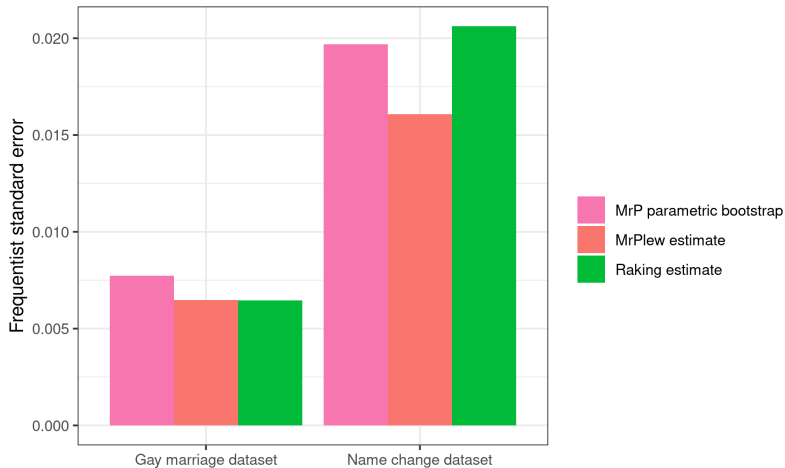
$$\begin{aligned} \sqrt{N} (\hat{\mu}_{\text{MrP}} - \mu_\infty) &\rightarrow \mathcal{N}(0, V) \quad \text{for some } \mu_\infty \text{ and variance } V, \text{ and} \\ \frac{1}{N_S} \sum_{i=1}^{N_S} (\psi_n - \bar{\psi})^2 &\rightarrow V. \end{aligned}$$

The use of  $w_n^{\text{MrP}}$  is exactly analogous to the use of raking weights for standard error estimation. This builds on our earlier work on the Bayesian infinitesimal jackknife<sup>1</sup>.

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<sup>1</sup>G. and Broderick 2024.

## Frequentist standard errors



**Figure 3:** Frequentist standard deviation estimates



G. and T. Broderick (2024). *The Bayesian Infinitesimal Jackknife for Variance*. arXiv: 2305.06466 [stat.ME]. URL: <https://arxiv.org/abs/2305.06466>.